

REMARKS/ARGUMENTS

Claims 1-20 are pending.

The Examiner rejected claims 1, 3, 4, 11-18, and 20 under 35 U.S.C. 103(a) as being unpatentable over Sha et al. (Plasma Etching Selectivity of ZrO_2 to Si in BCl_3/Cl_2 plasma). The Examiner noted that Sha does not disclose the flow ratio of $Ar:BCl_3$ and $BCl_3:Cl_2$ are 2:1-1:2 and 2:1-20:1 respectively, but that Sha suggests experimentally, but Sha on page 1916, left column, second paragraph, and page 1920, right column suggests experimentally determining the etching gas percentages. The Examiner further stated that it would be obvious to determine flow ratios through routine experimentation in order to provide optimum gas concentrations to provide a highly selective etching of the high-k dielectric layer with a reasonable expectation of success.

It would not be obvious to obtain the flow ratios as recited in claims 1 and 18, in view of Sha. Sha on page 1916, left column, second paragraph, cited by the Examiner states that the experimental flow ratios of BCl_3/Cl_2 was varied from 0% to 95% and that the percentage of Ar was 5%. These parameters do not cover the ranges recited in claims 1 and 18. Page 1920, right column of Sha discloses measuring etch rates of pure Cl_2 plasma with the addition of BCl_3 . Again, these parameters do not cover the ranges recited in claims 1 and 18. Instead, page 1921, left column, third paragraph, of Sha further states that pure BCl_3 plasma provided the highest etch selectivity of 1.5, which teaches away from the recited flow ranges. Nothing in Sha teaches the claimed flow ratios and nothing in Sha points to the probability of successfully achieving the etch selectivity achieved by the recited flow ratios. For example, nothing in Sha teaches or suggests such a high Ar flow rate to obtain the recited flow ratios. Nothing in Denton remedies this deficiency.

In addition, claim 18 further recites additional steps for forming a semiconductor device with a high dielectric constant gate, which provides ion implantation after the high dielectric constant layer has been etched. For example, nothing in Sha nor Donnelly, Jr. discloses or makes obvious these additional limitations. For at least these reasons claims 1 and 18 are not made obvious by Sha and Donnelly, Jr.

The Examiner rejected claims 2, 5-10, and 19 under 35 U.S.C. 103(a) as being unpatentable over Sha et al. (Plasma Etching Selectivity of ZrO_2 to Si in BCl_3/Cl_2 plasma) in view of Kumar et al. (US 2004/0209468 A1).

Dependent claims 2-17 and 19-20 are also patentably distinct from the cited references for at least the same reasons as those recited above for independent claims, upon which they ultimately depend. These dependent claims recite additional limitations that further distinguish these dependent claims from the cited references.

For example, claims 2 and 19 further recite that the wafer is maintained at a temperature below $150^\circ C$. It would not be obvious to use the temperature range of Kumar in Sha. Paragraph [[0040]] of Kumar discloses using an etch gas mixture of Cl_2 and CO, which is a different gas chemistry than that gas chemistry of Sha. It is not obvious that the temperature range of Kumar using a different gas chemistry would successfully provide a selective etch in the process taught in Sha.

In addition, claims 8 and 15 recite a selectivity of 4:1. Page 1921, left column, third paragraph, of Sha teaches that pure BCl_3 plasma provided the highest etch selectivity of 1.5, which is significantly less than 4:1. Nothing in any of the references suggests a likelihood of success of obtaining the recited selectivity. For at least these reasons, claims 2-17 and 19-20 are not made obvious by the cited references.

Applicants believe that all pending claims are allowable and respectfully request a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at telephone number (650) 961-8300.

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP



Michael Lee
Registration No. 31,846

P.O. Box 70250
Oakland, CA 94612-0250
Telephone: (650) 961-8300